

Storm warnings.—Two or three storms of considerable intensity affected the Great Lakes during the month, and in addition there were several disturbances of less importance that called for storm warnings of more or less general scope. Thus, either storm or small-craft warnings were issued on a total of 14 days.

On the 6th rather general warnings were disseminated in connection with a disturbance that had formed two days previously over the northern Rocky Mountain region and moved eastward with increasing force. Winds of from strong to gale force occurred over most of Lakes Superior, Erie, and Ontario in this connection.

The next warning was issued on the 9th for a disturbance that developed over the Middle Atlantic States and in conjunction with a large high pressure area over the northern Great Plains caused winds of from strong to gale force over the Lower Lakes, as well as southern Lake Huron. The warning in question was intended for small craft, whereas a storm warning would have been justified. The wind continued strong over most of the Lower Lakes on the 10th.

On the 14th northwest storm warnings were issued for eastern Lake Superior and northern Lake Huron, and small-craft warnings advised for the Lower Lakes and southern Lake Huron for a disturbance that moved from the far Northwest and reached Lake Superior with increased energy. For the most part the warnings were justified. A second disturbance quickly followed on the 15th, for which small-craft warnings were advised for Lake Superior.

The next storm to call for warnings was present on the afternoon of the 16th over the Arkansas Valley, moving northeastward, and apparently about to increase in force. Accordingly, northeast warnings were issued for southern Lake Michigan, but were recalled when the evening reports indicated that the disturbance had not developed to any extent. However, a sudden and marked increase in intensity took place that night, and the center of the storm had moved to eastern New York by the morning of the 17th. As a result, small-craft warnings were advised for the Lower Lakes from Cleveland, Ohio, east.

One of the most important storms developed over the Upper Lakes on the 18th. On the morning of that date small-craft warnings were advised for Lake Superior and northern Lake Michigan, and at night storm warnings were issued for most of the Upper Lakes section. On the following morning these were extended over southern Lake Huron and the Lower Lakes. This storm was of considerable severity along the eastern shore of Lake Michigan, where at Grand Haven, Mich., a maximum velocity of 53 miles an hour was reached.

A disturbance that developed over the southern Great Plains and moved northeastward across the Ohio Valley called for southeast storm warnings on the morning of the 24th over most of the Lower Lakes section, and small-craft warnings for southern Lake Huron and extreme western Lake Erie. However, the warnings were recalled 12 hours later when it appeared that the disturbance was losing force. But, as in the storm of the 16th-17th, a marked increase in intensity occurred over night, so that storm warnings had to be issued on the 25th for Lakes Huron and Ontario, as well as Lake Erie from Cleveland, Ohio, east; and small-craft warnings were advised for western Lake Erie.

On the morning of the 26th northwest storm warnings were issued for Lakes Michigan and Huron and southwest warnings for Lake Erie for a disturbance then over the middle Mississippi Valley. In the afternoon the

warnings were extended over Lakes Superior and Ontario. The disturbance lost force, with the result that no high winds of consequence occurred. However, in connection with a marked area of high pressure over the northern Rocky Mountain Region and a depression of increasing depth over Lake Superior, northwest warnings were continued on Lake Superior on the 27th, as well as issued for Lake Michigan and northern Lake Huron. On the next day the warnings were extended over the remainder of the Lakes. Although verifying wind velocities did not occur at all stations, there is no question that the warnings were justified. On portions of Lake Superior this storm was rather severe.

Frost warnings.—At the beginning of October the growing season, already over in most of the extreme northern portion of the district, was terminated over the remainder except in the extreme south, by the general cool wave at the close of the first decade. After the 10th a few frost warnings were issued until the final warning of the 24th for southeastern Kansas. The frost warnings of this month were not of great economic importance, inasmuch as virtually all staple products had matured before frost occurred.

Cold-wave warnings.—These were issued on the 25th for a limited portion of the northwestern Great Plains area and on the 27th for most of the extreme southern part of the district. The cold period that occurred at this time was among the most notable in the history of the Weather Bureau for so early in the season, and record low temperatures prevailed over wide areas from the 28th to the 30th. At Rapid City, S. Dak., the phenomenally low minimum of -13° occurred. This is 15° lower than any previous reading at that station for October.

Livestock warnings.—Forecasts for the benefit of stock interests were issued on the 5th, 25th, and 27th. That of the 25th proved to be most timely.

Special forecasts.—A special forecast for the benefit of the contestants in the first annual Detroit News ballooning trophy race was made on the 3d. Although the forecast was for distinctly unfavorable conditions, nevertheless the flight was held, with the result that most of the balloonists had a most perilous trip.—C. A. Donnel.

NEW ORLEANS FORECAST DISTRICT

High pressure over the northern portion of the country, with relatively low pressure over the Southwestern States, prevailed during much of the month, attended by comparatively wet, cold weather in this forecast district. Nevertheless, the first week was unseasonably warm because the hot weather of September continued into October, there being no invasion of colder air from the north until the closing days of the first decade. The mean temperature for the month was the lowest of record in Oklahoma and the north portion of west Texas.

The p. m. map of the 24th showed a moderate disturbance over south Texas, with a strong gradient thence northward to Oklahoma. Northwest storm warnings were ordered for the Texas coast from Port Arthur to Freeport and northwest gales of brief duration occurred within the ensuing six hours. The gradient had greatly diminished by the next morning and the warnings were lowered.

Northwest storm warnings were issued for the Texas coast on the 27th at 8:30 p. m., because of a well-developed area of high pressure which was moving rapidly southeastward from the northern Rocky Mountain

States. The pressure gradient diminished as the HIGH advanced to the coast and winds did not reach verifying velocity.

Small-craft warnings were displayed on the Texas coast on the 9th, 19th, 26th, and 30th, and the afternoon of the 23d; and on the Louisiana coast on the 28th and 30th; also by the official in charge at Corpus Christi, Tex., on the afternoon of the 24th. These warnings were justified.

A cold wave of unusual severity for so early in the season overspread the northern portion of the district on the 28th-29th, for which cold-wave warnings had been issued on the a. m. map of the 27th for Oklahoma and the north portion of west Texas, extended on 2 p. m. special observations for Arkansas and north and central Texas, and further extended at night and the following morning for the remainder of the district. A marked change to unseasonably cold weather extended to the coast; but on account of the rapid eastward movement of the area of high pressure the isobars assumed an east-west trend, and cloudy weather, with rain, occurred in the more southern sections of the district, preventing the low temperature required for a cold wave. On the 30th, with low pressure moving eastward over the Gulf of Mexico while low temperatures continued, freezing weather threatened in the interior sections of the southern portion of the district; but the weather remained cloudy, preventing frost and freezing temperature that were forecast for the morning of the 31st.

Besides the warnings issued during the last few days of the month, frost or freezing temperature was forecast for northern sections of the district on the 9th, 10th, 17th, 18th, and 24th, and for most northern and central sections on the 19th, 20th, and 26th; and conditions occurred mostly as forecast.—*R. A. Dyke.*

DENVER FORECAST DISTRICT

October weather was unusual in several respects. Temperatures averaged below normal generally, especially in eastern Colorado and southwestern Arizona. The mean temperature at Denver was the lowest of record for October. A great deal of cloudiness prevailed; the percentage of possible sunshine was less than half the normal at Denver, while at Phoenix and Yuma, Ariz., the percentages were the lowest of record. A new record for the number of days with precipitation in October was established at Denver, there being 15 days with 0.1 inch or more, the previous record being 12 days. Precipitation was above normal except in northwestern Utah, southeastern Colorado, and southeastern New Mexico. The amounts received at the various stations varied from about double the normal to several times normal. At Yuma, Ariz., there has been only one other October in 56 years having as much rain as this one.

These unusual conditions resulted mainly from almost continuously high barometric pressure to the north and east of the district. Some of the HIGHS that crossed this region were of unusual intensity for so early in the season.

The one that appeared over Alberta on the morning of the 25th was drawn southward into Montana by the movement of a disturbance from the northeastern Rocky Mountain slope to Texas; it remained over the northern States, with varying intensity, until the morning of the 27th, by which time a rather energetic disturbance had developed in eastern Colorado. As it was evident that the displacement of this LOW would result in a cold wave, warning of a moderate cold wave was issued to eastern Colorado, including advices to livestock interests in

southeastern Colorado. This warning was verified. Cold waves in any part of the Denver district in October are of rare occurrence.

Warnings of frost and freezing temperature, nearly all of which were justified, were issued to various parts of the district almost daily from the 1st to the 26th, by which time killing frosts had occurred everywhere except in the extreme southern portion of the district.—*E. B. Gittings, jr.*

SAN FRANCISCO FORECAST DISTRICT

The weather during October, 1925, was remarkable for the small amount of precipitation recorded, except in southern California and the Plateau region. A small depression developed over the lower Colorado River Valley during the first week and gave heavy rain in southern California, especially in the extreme south and Mojave desert and more than normal amounts in Nevada and southern Idaho. In the North Pacific States very little rain fell, and was mostly confined to western Washington during the last decade.

To understand the unusual condition which prevailed, it is necessary to study the distribution of barometric pressure over Bering Sea, Alaska, and the north Pacific Ocean. The pressure was low over Bering Sea and Alaska until the 21st, when an area of high pressure appeared over the Pribilof Islands and moved rapidly eastward over northern Alaska and disappeared to the east on the 25th. The area of high pressure was closely followed by another large storm which continued over the north Pacific and Alaska until the end of the month. A ridge of high pressure continued off the coast during the entire month. This distribution of pressure caused all storms from the ocean to pass inland north of Queen Charlotte Island.

Southwest storm warnings were ordered on the Washington coast on the 24th, but no verifying velocities occurred. Advisory warnings of storm conditions along the Great Circle route to the Orient were sent several times to North Pacific stations for the benefit of shipping bound for the Orient and Alaska. Warnings of expected high seas along the coast were sent frequently to the United States engineers building the jetty at the mouth of Humboldt Bay.

Special forecasts for fruit driers in the valleys of northern California were broadcast daily and were appreciated, as shown by the following extracts from letters received: From horticultural commissioner, Sutter County: "We have appreciated the service you have given us this season and hope to be able to take advantage of it another year." From county agent, Sonoma County: "I wish to express for the growers their appreciation of the service this year, and especially for the 12:30 p. m. radio reports."—*G. H. Willson.*

RIVERS AND FLOODS

By R. E. SPENCER

The only important flood of the month occurred following the 17th in the White River of Arkansas and its tributaries. The river, still high as a result of precipitation on the 7th and 8th, rose rapidly following rather heavy rains on the 16th, passing flood stage at several stations (see table). Warnings, which were issued well in advance of the flood, resulted in a saving of \$38,000 in that portion of the inundated area from which reports could be obtained, while unavoidable losses, principally in cotton and corn crops, were estimated as follows: